BACHELOR 'S PROGRAMME
2nd YEAR OF STUDY, 1st SEMESTER

COURSE TITLE	OPTICS
COURSE CODE	
COURSE TYPE	full attendance
COURSE LEVEL	1st cycle (bachelor's degree)
YEAR OF STUDY, SEMESTER	2nd year of study, 1st semester
NUMBER OF ECTS CREDITS	5
NUMBER OF HOURS PER WEEK	7 (3 lecture hours + 4 seminar hours)
NAME OF LECTURE HOLDER	Lect. Univ. Dr. Cătălin AGHEORGHIESEI
NAME OF SEMINAR HOLDER	Lect. Univ. Dr. Cătălin AGHEORGHIESEI, Lect. Univ. Dr. Bogdănel-Silvestru MUNTEANU
PREREQUISITES	Advanced level of English

A GENERAL AND COURSE-SPECIFIC COMPETENCES

General competences:

- → Achievement of professional tasks efficiently and responsibly, in compliance with the field-specific deontology legislation, with qualified assistance.
- → Application of efficient work techniques in a multi-disciplinary team, on various hierarchical levels.
- → Effective use of information sources and communication resources and assisted professional training, both in Romanian and in a foreign language.

Course-specific competences:

- → Derivation of working formulas for calculations with physical quantities using appropriate principles and laws of Physics.
- → Description of physical systems, using specific theories and tools (experimental and theoretical models, algorithms, schemes, etc.)
- → Application of the principles and laws of Physics in solving theoretical or practical problems, under qualified assistance conditions.
- → Correct application of methods of analysis and of criteria for choosing the appropriate solutions to achieve the specified performances.
- → Comparative assessment of the theoretical results offered by literature and of an experiment conducted in the framework of a professional project.
- → Elaboration of graphs and reports for explaining and interpreting physical results obtained by statistical methods.
- → Correlation of statistical analysis methods on a given topic (realization of measurements/calculations, data processing, interpretation).
- → Application of Physics knowledge both in given situations in related fields and in experiments, using standard laboratory equipment.
- → Explanation and interpretation of physical phenomena by formulating assumptions and operationalizing key concepts and proper use of laboratory equipment.
- → Identification of Physics and Informatics methods, techniques and tools; Design of Physics experiments using specific laboratory methods and equipment.
- → Critical assessment of the results obtained by employing a physical model, including the degree of uncertainty of the obtained experimental results.
- → Implementation, improvement and extension of a physical model utilization. Making experimental devices capable of validating a physical model.

B LEARNING OUTCOMES

On successful completion of this subject, students will be able to:

- Describes the main optical phenomena and optical radiation propagation theories
- To explain how optical phenomena, occur and take place, based on models proposed
- Compute the physical quantities associated with the propagation of optical radiation under certain given conditions
- Critically analyze the results
- Use theoretical notions for designing and experimenting with optics
- Apply the knowledge gained in solving some optical problems in physics and astrophysics

C LECTURE CONTENT

Electromagnetic Waves

- Proprieties of electromagnetic waves;
- Emission of electromagnetic waves;
- Flux densities of energy and momentum;

	Electromagnetic Waves - Polarization of electromagnetic waves; - Coherence of the optic waves - Propagation of light in isotropic media: reflection, refraction, total reflection Geometrical optics: - Optical diopter, mirrors, lenses, prisms Geometrical optics: - Optical systems with 2 thin lenses, Aberrations Optical Instruments: - Microscopes and telescopes Interference: - Two-beam interference generated by a point source; - Interference devices based upon amplitude division Interference: - Two-beam interference through wave front splitting; - Multiple-beam interference Diffraction: - Fresnel zone method; - Kirchhoff's approximation Diffraction: - Fraunhofer and Fresnel diffraction; Propagation of light in anisotropic media: - Propagation of a plane wave in an anisotropic medium, birefringence - Rotation of polarized waves Scattering and absorption of light: - Scattering and absorption process; - Rayleigh and Mie Scattering; Radiometry and photometry: - Radiant and photometric quantities; - Photometric quantities; - Relation between radiant and luminous characteristics of radiation Sources and optical radiation receptors; - Applications in astrophysics; Course recapitulation
D	RECOMMENDED READING FOR LECTURES
	1. A.N. Matveev, Optics, Mir Publishers, 1988 2. Eugene Hecht, Optics, Pearson, 2017 3. I. R. Kenyon, A Modern Introduction to Classical and Quantum Optics, Oxford University Press, 2008 4. Douglas S. Goodman, Handbook of Optics, McGraw-Hill, 1994 5. Hartmann Römer, Theoretical Optics, Wiley, 2005 6. Daniel J. Schroeder, Astronomical Optics, Academic Press, 2000
E	SEMINAR CONTENT
	Electromagnetic waves Polarization of light Geometrical optics Interference Diffraction Determination of the refractive index of a prism by the minimum deviation method; Dispersion of a prism, spectroscope; Photometry experiments; Study of optical wave polarization; Propagation of light in anisotropic media; Study of absorption spectra using the Pulfrich photometer; Determining focal lengths of lenses and lens systems; Microscopes; Telescopes; Interference, Newton rings; Rayleigh interferometer; Fraunhofer diffraction; Recapitulation Laboratory colloquium
F	RECOMMENDED READING FOR SEMINARS
	1. Vladimir P. Ryabukho, Problems and answers in wave optics, SPIE 2011 2. Ajawad I. Haija, M. Z. Numan and W. Larry Freeman, Concise OpticsConcepts, Examples, and Problems, CRC Press, 2018 3. Chris McMullen, Creative Physics Problems, Custom Books, 2008 4. M. Delibaș, D. Dorohoi, Lucrări practice de optică, Ed. Univ. "Al. I. Cuza", Iași (1999) 5. Silviu Gurlui, Mihai Delibaș, Optica Exerciții și probleme, Tehnopress Iași, 2005

G	EDUCATION STYLE
LEARNING AND TEACHING METHODS	Lectures, Problems solving Experiment Report, Discussions
ASSESSMENT METHODS	• Exam: problems and theory • Final test
LANGUAGE OF INSTRUCTION	English